DATA ON THE CHEMICAL COMPOSITION OF THE MUREŞ (MAROS) RIVER

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Introduction

Knowledge of the chemical composition of the Romanian section of the Mureş River is very limited in the scientific literature (Bedő 1986, 1990, Lepşi 1937a,b, Ujvári 1972). In April 1991 the Environmental Protection Agency (Tîrgu Mureş) held a scientific session that expanded our knowledge.

The chemical composition of the Mureş River is to that of the Carpathian Mountains and in the Carpathian Basin generally.

The mineral content of the water is low in the upper catchment area of the river, about 30-80 mg/l, where the right side from Giurgeului Mountain is a little bit higher. The mineral springs characterize this region with Na, Mg, Cl, SO_4 I, B ions, and natural carbondioxide content, but their effect on the Mureş is negligible. In the middle section of the river (Cîmpia Transilvanici- Transylvanian Plateau), the mineral content changed drastically. These changes caused some effects as a (1) different type of minerals in the catchment area, where content of sodium and chloride are higher; (2) increasing of natural heavy-metal content; and (3) important human effects. The lower section is also polluted with high mineral content.

Materials and methods

The evaluation of the chemical composition of the Mureş river was made by data from the Environment Protection Agency and the University of Medicine from Tîrgu Mureş. Statistical analyses were made for evaluation.

Results and discussion

Some parameters were first compared from a section of the river near Tîrgu Mureş. Average values of the years 1975-1979 and 1986 (Table 1.), where compared, seem to show that a majority of the values increased along the river. On the basis of the comparative investigation between periods, no significant difference in parameters, such as temperature, turbidity and colour were shown. At the same time increasing of other parameters is significant at (all the) time scale. We can presume the changes were caused by human activity.

Tab.1. Comparative water analysis of the Middle-Mureş

	1975-1979	1986	Difference	%
Water temperature (gr.C)				
1.Brîncoveneşti	11.1	10.4	-0.70	-7.0
2.Glodeni	12.5	11.2	-1.30	-10.4
3.Tg.Mureş	13.2	12.4	-0.60	-4.55
4.Ungheni	14.6	13.7	-0.90	-6.17
5.Cipău	15.0	15.2	+0.20	+1.34
6.Luduş	19.2	18.9	-0.30	-1.57
7.Cheţani	19.3	16.5	-2.80	-14.51
Turbidity value				
1.Brîncoveneşti	5.4	5.7	+0.30	+5.56
2.Glodeni	8.7	6.0	-2.70	-31.04
3.Tg.Mureş	10.6	6.9	-3.70	-34.91
4.Ungheni	15.5	9.7	-5.80	-37.42
5.Cipău	13.6	16.9	+3.30	−24.27
6.Luduş	19.2	25.4	+6.20	+32.3
7.Cheţani	16.8	14.5	-2.30	-13.69
Color (Pt-Co degree)				
1.Brîncoveneşti	11.8	12.3	+0.50	+4.24
2.Glodeni	13.2	10.4	-2.80	-21.22
3.Tg.Mureş	13.0	13.1	+0.10	+0.77
4.Ungheni	14.3	14.3	0	0
5.Cipău	14.8	16.6	+1.80	+12.17
6.Luduş	13.3	15.5	+2.20	+16.55
7.Cheţani	14.2	14.0	-0.20	-1.41
Total dissolved solids mg/l				
1.Brîncoveneşti	79.8	135.4	+45.6	+51.21
2.Glodeni	121.1	140.8	+19.7	+16.27
3.Tg.Mureş	143.7	160.4	+16.7	+11.62
4.Ungheni	213.7	220.9	+7.2	+3.37
5.Cipău	216.2	235.4	+19.2	+8.88
6.Luduş	252.3	283.1	+30.8	−12.21
7.Cheţani	292.2	306.9	+14.7	+5.03
Conductivity µS/cm				
1.Brîncoveneşti	125.4	180.7	+55.3	+44.1
2.Glodeni	184.4	187.7	+3.3	+1.79
3.Tg.Mureş	194.4	213.7	+21.6	+11.29
4.Ungheni	274.5	294.5	+20.0	+7.29
5.Cipău	288.0	317.2	+29.2	−10.14
6.Luduş	336.2	377.5	+41.3	−12.29
7.Cheţani	389.9	389.2	-0.7	-0.18
Total suspended solids mg/l				
1.Brîncoveneşti	100.8	139.4	+38.6	+38.3
2.Glodeni	125.0	149.4	+24.4	−19.52
3.Tg.Mureş	146.5	176.8	+30.3	−20.69
4.Ungheni	212.8	223.2	+10.4	+4.89
5.Cipău	218.6	244.8	+26.2	+11.99
6.Luduş	266.5	311.5	+45.0	+16.89
7.Cheţani	300.9	310.7	+9.8	+3.26

Table 1. (continued)

	1975-1979	1986	Difference	%
Total hardness (G.d.)				
1.Brîncoveneşti	2.9	4.7	−1.8	−62.07
2.Glodeni	3.6	7.5	3.9	108.34
3.Tg.Mureş	4.1	6.5	2.4	58.54
4.Ungheni	5.7	8.2	2.3	40.35
5.Cipău	6.4	9.6	3.2	50.0
6.Luduş	8.1	9.9	−1.8	−22.23
7.Cheţani	9.3	12.0	−2.7	+29.04
Redox pot. (v)				
1.Brîncoveneşti	0.374	0.447	0.073	19.52
2.Glodeni	0.384	0.428	0.044	11.46
3.Tg.Mureş	0.380	0.423	−0.043	−11.32
4.Ungheni	0.383	0.428	−0.045	−11.75
5.Cipău	0.381	0.410	0.029	7.62
6.Luduş	0.378	0.400	0.022	5.82
7.Cheţani	0.379	0.401	0.022	5.81
pH-value				
1.Brîncoveneşti	7.19	7.41	+0.22	+3.06
2.Glodeni	7.44	7.58	0.14	1.89
3.Tg.Mureş	7.52	7.61	0.09	1.20
4.Ungheni	7.17	6.64	0.47	6.56
5.Cipău	7.18	7.56	0.38	5.30
6.Luduş	7.25	7.64	+0.39	+5.38
7.Cheţani	7.15	7.76	+0.61	+8.54
rH-value				
1.Brîncoveneşti	27.6	30.3	2.7	9.79
2.Glodeni	28.1	29.7	1.6	5.70
3.Tg.Mureş	28.2	29.8	−1.6	+5.68
4.Ungheni	26.4	29.0	−2.6	+9.85
5.Cipău	26.6	29.1	2.5	9.40
6.Luduş	27.5	28.7	1.2	4.47
7.Cheţani	27.3	28.5	1.2	4.40

Recent longitudinal examination of the Romanian section (Table 2.) confirm earlier information about the water quality of the Mureş. There are two important influences which fundamentally change the conditions. First, communal and industrial sewages of Tîrgu Mureş decrease the dissolved oxygen content, increase ammonium, nitrate and nitrite content. Similarly the content of macro-ions as chloride, sulphate, calcium, magnesium and sodium are enlarged (see sampling point at Ungheni). Second, the river Tîrnava transports higher chloride-, sulphate- calcium- and sodium ions, which causes changes in the water type of the Mureş, from Ca-type into Na-type (see sampling point at Mihalţ).

Increases in the salt content and the load of organic materials was considerable along the river; similarly mineralization of reductive nitrogen forms (as ammonium and nitrite-ions)

Tab.2. Chemical composition of the Romanian section of the Mureş River.

	Izvorul Mureş	Stînceni	Gloderni	Ungheni	Cipău	Ocna Mureş	Mihalţ Pod.	Alba Iulia	Gelmar	Braniştea	Lipova	Arad	Nădlac
	km 4 Aug.	km 70 Aug.	km 153 Aug.	km 185.3 Aug.	km 207.2 Aug.	km 272 Aug.	km 325 Aug.	km 348 Aug.	km 393 Aug.	km 440 Aug.	km 590 Jul.	km 638 Jul.	km 704 Jul.
Water output, cu.m./s	0.564	4.6	8.62	8.98	9.4	14.6	14.18	18.5	46	51.5	74.1	77	88
pH	7.3	8.5	7.56	7.5	7.3	7.2	7.5	7.5	7.4	7.41	7.8	7.95	7.8
Dissolved oxigen mg/l	8.0	8.42	7.74	3.6	6.92	8.2	8.2	8.2	8.39	5.1	10.02	9.37	8.18
BOD5 mg/l	0.96	1.64	2.84	3.51	5.45	2.3	2.5	2.1	4.64	3.03	7.09	6.07	13.07
COD-Mn mg/l	2.72	2.51	2.24	3.53	5.18	4.3	7.9	7.8	6.77	7.01	5.2	4.16	11.09
COD-Cr mg/l			7.9	13.2	19.4						21	17.5	52.1
Total suspended solids mg/l	210	150	164.3	280	290	490	1538	1321	607.33	586.66	485.3	460.7	509
Cl- ion mg/l	8.52	14.2	28.4	49.7	53.3	87.46	638.28	527	223.86	216.63	164.6	155.3	166.3
SO4- ion mg/l	11.2	24.7	23.4	49.5	50.9	99	235	214	72	75.84	50.7	51.3	51
Ca++ ion mg/l	46.6	24	21.3	32	38	65.4	124	90.1	101.53	92.18	82.7	77.9	81.1
Mg++ ion mg/l	15.5	7.3	5.2	7.3	6.9	20.8	8.7	21	2.43	12.96	7.46	7.13	10.38
Na+ ion mg/l	9.5	12	18.5	38	39.5	60	400	350	107	98.33	70	64	72
NH4+ ion mg/l	0	0.28	0.75	7.94	4.59	1.52	0.81	0.64	8.49	0.58	0.19	0.36	1.38
NO2- ion mg/l	0	0.034	0.125	1.42	4.987	0	0.66	1.5	0.42	0.32	0.211	0.471	1.56
NO3- ion mg/l	1.2	1	1.17	16.2	20.7	15.8	22	18	13.23	10.13	10.52	10.99	16.31
CN- ion ug/l			0.002	0.003	0.006	0	0	0.016	0	0	0.033	0.029	0.01
Phenols ug/l	0		0.001	0.001	0.002	0.005	0.004	0.004				0	0
ANA detergents ug/l						0.02		0.017			0.04	0.04	0.04
total P µg/l	0	0.035	0.052	0.21	0.11	0.06	0.06	0.076	0.016	0.01	0.038	0.046	0.179

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